

1 **What is claimed is:**

2 1. A brushless DC motor with axial winding and axial air gap, comprising:

3 a casing;

4 a pole comprising a plurality of first pole edges and a positioning hole;

5 a magnetically conductive tube having a first end extended through the positioning hole  
6 of the pole in an intimate contact manner and fixed to the casing, the magnetically conductive  
7 tube having a second end with a plurality of second pole edges having a number the same as  
8 that of the first pole edges, the first pole edges and the second pole edges being alternately  
9 located with respect to each other;

10 a bobbin including a central hole through which the magnetically conductive tube  
11 extends, the bobbin having a winding wound therearound, the winding having a plurality of  
12 terminals;

13 a drive means including a plurality of control elements and a plurality of sensing  
14 elements, the drive means further including a plurality of contacts for electrical connection  
15 with the terminals of the bobbin; and

16 a rotor including a round top from which a central shaft extends, the central shaft being  
17 rotatably mounted in the magnetically conductive tube, the round top of the rotor having a  
18 magnetic disc securely attached thereto;

19 wherein the magnet disc and the first pole edges of the pole and the second pole edges  
20 of the magnetically conductive tube are repulsive to each other, and the drive means varies  
21 polarities of the first pole edges and the second pole edges to thereby drive the rotor.

22 2. The brushless DC motor with axial winding and axial air gap as claimed in claim 1, wherein  
23 the casing includes a tube having an inner periphery for tight contact with the magnetically  
24 conductive tube, the magnetically conductive tube including a bearing mounted to an inner  
25 periphery thereof.

26 3. The brushless DC motor with axial winding and axial air gap as claimed in claim 1, wherein  
27 the casing includes a tube with an outer periphery, the magnetically conductive tube being

1 mounted around the outer periphery of the tube of the casing, the tube of the casing including  
2 a bearing securely mounted to an inner periphery thereof.

3 4. The brushless DC motor with axial winding and axial air gap as claimed in claim 1, wherein  
4 the magnetically conductive tube is in tight engagement with the positioning hole of the pole.

5 5. The brushless DC motor with axial winding and axial air gap as claimed in claim 1, wherein  
6 the drive means is mounted on a circuit board, the circuit board including a central hole  
7 through which the magnetically conductive tube extends.

8 6. The brushless DC motor with axial winding and axial air gap as claimed in claim 5, wherein  
9 the circuit board includes a plurality of end walls for respectively engaging with two ends of  
10 each of the pole edges of the pole.

11 7. The brushless DC motor with axial winding and axial air gap as claimed in claim 2, wherein  
12 the tube of the casing includes a support element mounted therein for supporting a distal end  
13 of the central shaft of the rotor.

14 8. The brushless DC motor with axial winding and axial air gap as claimed in claim 1, wherein  
15 the round top of the rotor and the magnet disc includes a metal plate mounted therebetween.

16 9. A brushless DC motor with axial winding and axial air gap, comprising:

17 a casing;

18 a pole comprising a tube formed in a center thereof, the pole comprising a plurality of  
19 inner pole edges and a plurality of outer pole edges, the inner pole edges and the outer pole  
20 edges being alternately located relative to each other along an angular position, the tube of the  
21 pole being fixed to the casing;

22 a bobbin comprising a central hole through which the tube of the pole extends, the  
23 bobbin having a winding wound therearound, the winding having a plurality of terminals;

24 a magnetically conductive tube having a first end extended through the positioning hole,  
25 the bobbin having a winding wound therearound, the winding having a plurality of terminals;

1 a drive means including a plurality of control elements and a plurality of sensing  
2 elements, the drive means further including a plurality of contacts for electrical connection  
3 with the terminals of the bobbin; and

4 a rotor including a round top from which a central shaft extends, the central shaft being  
5 rotatably mounted in the tube of the pole, the round top of the rotor having a magnetic disc  
6 securely attached thereto;

7 wherein the magnet disc and the inner pole edges and outer pole edges of the pole are  
8 repulsive to each other, and the drive means varies polarities of the inner pole edges and the  
9 outer pole edges to thereby drive the rotor.

10 10. The brushless DC motor with axial winding and axial air gap as claimed in claim 9,  
11 wherein the casing includes a tube having an inner periphery for tight contact with the tube of  
12 the pole, the tube of the pole including a bearing mounted to an inner periphery thereof.

13 11. The brushless DC motor with axial winding and axial air gap as claimed in claim 9,  
14 wherein the round top of the rotor and the magnet disc includes a metal plate mounted  
15 therebetween.

16 12. The brushless DC motor with axial winding and axial air gap as claimed in claim 9,  
17 wherein the drive means is mounted on a circuit board, the circuit board including a central  
18 hole through which the tube of the pole extends.

19 13. The brushless DC motor with axial winding and axial air gap as claimed in claim 9,  
20 wherein the circuit board includes a plurality of end walls for respectively engaging with two  
21 ends of each of the outer pole edges of the pole.

22 14. The brushless DC motor with axial winding and axial air gap as claimed in claim 10,  
23 wherein the tube of the casing includes a support element mounted therein for supporting a  
24 distal end of the central shaft of the rotor.

25 15. The brushless DC motor with axial winding and axial air gap as claimed in claim 9, further  
26 comprising a magnetically conductive tube mounted in the tube of the pole.

1 16. The brushless DC motor with axial winding and axial air gap as claimed in claim 15,  
2 wherein the magnetically conductive tube includes a plurality of pole edges having a number  
3 the same as that of the inner pole edges of the pole, the pole edges of the magnetically  
4 conductive tube and the inner pole edges of the pole being aligned with each other in angular  
5 positions thereof.

6 17. The brushless DC motor with axial winding and axial air gap as claimed in claim 15,  
7 wherein the magnetically conductive tube is in tight engagement with an inner periphery of the  
8 tube of the pole.

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